



Docket No. AUS920000350US1

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Ghoshal**

Serial No. **09/726,281**

Filed: **November 30, 2000**

For: **Method and Apparatus for
Characterization of Thermal Response
of GMR Sensors in Magnetic Heads
for Disk Drives**

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Group Art Unit: **2125**

Examiner: **Kasenge, Charles R.**

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**Commissioner for Patents
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**ATTENTION: Board of Patent Appeals
and Interferences**

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By:

Amelia C. Turner
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APPELLANT'S BRIEF (37 C.F.R. 1.192)

This brief is in furtherance of the Notice of Appeal, filed in this case on March 22, 2004.

The fees required under § 1.17(c), and any required petition for extension of time for filing this brief and fees therefore, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief is transmitted in triplicate. (37 C.F.R. 1.192(a))

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REAL PARTIES IN INTEREST

The real party in interest in this appeal is the following party: International Business Machines, Inc.

RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal, there are no such appeals or interferences.

STATUS OF CLAIMS

A. TOTAL NUMBER OF CLAIMS IN APPLICATION

Claims in the application are: 1-44

B. STATUS OF ALL THE CLAIMS IN APPLICATION

1. Claims canceled: NONE
2. Claims withdrawn from consideration but not canceled: NONE
3. Claims pending: 1-44
4. Claims allowed: NONE
5. Claims objected to: 3-10, 14-20, 23-30 and 33-44
6. Claims rejected: 1, 2, 11-13, 21, 22, 31 and 32

C. CLAIMS ON APPEAL

The claims on appeal are: 1, 2, 11-13, 21, 22, 31 and 32.

STATUS OF AMENDMENTS

No amendments to the claims have been made after the Final Office Action.

SUMMARY OF INVENTION

The present invention is directed to a method and apparatus for using a heat probe to characterize the thermal response of giant magnetoresistive (GMR) sensors in magnetic heads for disk drives. The invention involves using a probe to measure the heat flow through the probe and controlling the heat flow through the probe so that it is substantially zero. This may involve cooling the magnetic head to a temperature below the ambient temperature and then applying a current to the magnetic head to warm the surface of the magnetic head until the heat flow through the probe is substantially zero. The thermal conductance of the dielectric material in the magnetic head may then be determined based on the applied current, the ambient temperature, and a temperature of the magnetic head.

ISSUES

The only issue on appeal is whether or not claims 1, 2, 11-13, 21, 22, 31 and 32 are indefinite under 35 U.S.C. § 112, second paragraph because the claims recite the feature of controlling the heat flow through a probe to be “substantially zero.”

GROUPING OF CLAIMS

Claims 1, 2, 11-13, 21, 22, 31 and 32 stand or fall together.

ARGUMENT

The Final Office Action rejects claims 1, 2, 11-13, 21, 22, 31 and 32 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention. This rejection is respectfully traversed.

As to claims 1, 2, 11-13, 21, 22, 31 and 32, the Final Office Action states:

The term “substantially zero” in claims 1, 2, 11-13, 21, 22, 31 and 32 is a relative term, which renders the claims indefinite. The term “substantially zero” is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Final Office Action dated February 20, 2004, page 2.

MPEP § 2173.05(b) states that “the fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite under 35 U.S.C. § 112, second paragraph.” This section further states that the acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed in light of the specification. Appellant respectfully submits that one of ordinary skill in the art would understand what is claimed by the use of the term “substantially zero” in the present claims, as discussed hereafter.

The use of the term “substantially” has been widely held to be a broad, yet definite, term. *In re Nehrenberg*, 280 F.2d 161, 126 USPQ 2383 (CCPA 1960). The court has held that the limitation “to substantially increase the efficiency of the compound as a copper extractant” was definite in view of the general guidelines contained in the specification. *In re Mattison*, 509 F.2d 563, 184 USPQ 484 (CCPA 1975). The court has also held that the limitation “which produces substantially equal E and H plane illumination patterns” was definite because one of ordinary skill in the art would know what was meant by “substantially equal.” *Andrew Corp. v. Gabriel Electronics*, 847 F.2d 819, 6 USPQ2d (Fed. Cir. 1988). The court further recognized that “the term ‘substantially’ in patent claims gives rise to some definitional leeway...Patentees may use these terms to avoid unduly limiting the modified word. Thus, the term ‘substantially’ may prevent

avoidance of infringement by minor changes that do not affect the results sought and accomplished.” *C.E. Equipment Co. Inc. v. United States*, 13, USPQ2d 1363, 1368 (Cl. Ct. 1989). The use of the term “substantially zero” in the present claims is similar to the uses of the term “substantially” in the above cited cases in that the term, while not precise, is readily understandable to those of ordinary skill in the art and the use of this term in the present application is to avoid unduly limiting the claims such that a potential infringer might make minor changes that do not affect the results sought and accomplished in order to avoid infringement.

One of ordinary skill in the art, in view of the present specification, would understand what is meant by the term “substantially zero” as it is used in the present claims. Pages 22-23 of the present specification describe the manner by which a probe may be used to thermally characterize a GMR sensor of a read/write head. As discussed on pages 22-23, this measurement takes advantage of a theoretical state in which the heat flow Θ through the probe is zero. In theory, absolute zero is achievable. However, in actuality, it may be difficult to achieve and maintain the heat flow at exactly zero due to many different factors, including physical limitations and human error. This is recognized in the use of the term “substantially zero” in the originally presented claims. Based on the present specification, it is clear to those of ordinary skill in the art that the term “substantially zero” means as close to zero as possible in view of these physical limitations, possible human error, and other factors that may make it impossible to achieve and maintain absolute zero heat flow through the probe.

Furthermore, the present specification provides guidelines for determining "substantially zero." As stated in the specification on pages 22-23, the reason for a zero or "substantially zero" heat flow through the probe is so that the Joule heat at the surface of the GMR sensor is conducted through the dielectric material to the magnetic shields and the effective thermal conductance between the GMR sensor and the magnetic shields may be calculated (see page 23, lines 7-12). Thus, the present specification provides general guidance as to what "substantially zero" means in the claims, i.e. a value that is as close to zero as possible, in view of physical and human limitations, which permits the effective thermal conductance between the magnetic head and the magnetic shields, i.e. the effective thermal conductance of the dielectric material, to be calculated.

The use of the term “substantially” in the present application is no more indefinite than the use of the term “substantially” in the above cited cases. In fact, the use of the term “substantially”

in the present application is more definite than these other uses, which were considered definite. For example, rather than merely reciting substantially "increased" or substantially "equal E and H plane illumination patterns," the present claims provide a datum by which to measure "substantially." That is, the present claims recite "substantially zero." Thus, the breadth of the term "substantially" is measured with regard to a designated value, i.e. "0." While the present claims may not be precise as to the range of values that fall within the term "substantially zero," those of ordinary skill in the art, within their knowledge of the art and the guidelines provided by the specification, are well aware of how close an achievable heat flow is to "0" heat flow. The particular heat flow value is irrelevant so long as the heat flow value is "substantially zero" such that the thermal conductance of the dielectric material in the magnetic head may be calculated in accordance with the presently claimed invention.

These arguments were presented to Examiner Kasenge and Supervisory Examiner Picard during a December 5, 2003 telephone interview. During the interview, the Examiners stated that the only way in which the Examiners would accept the use of the terminology "substantially zero" would be if Appellant set forth a range of values for the heat flow and shows what the "normal" heat flow value is in the prior art. The Examiners stated that the reason for this requirement to set forth a range and "normal" heat flow values is to make it "easier" during any potential future litigation to determine whether a particular value would be infringing on the feature of the heat flow being "substantially zero."

Appellant respectfully disagrees with the Examiners' position and submits that the Examiners' position essentially eliminates Appellant's ability to use the term "substantially" in the claims, a usage that has been held in case law and the MPEP to be perfectly valid and not indefinite. That is, if Appellant were to set forth a range of values for the heat flow such that the term "substantially" would be interpreted to be the range of values from some "normal" heat flow value, why would there be any need to use the term "substantially"? Appellant might as well set forth the range in the claims. Essentially, the Examiners' position is that Appellant must always recite their invention in the claims in terms of specific precise values.

As stated in *Bausch & Lomb Inc. v. Alcon Laboratories Inc.*, 64 F.Supp.2d 233, 240-45, 52 USPQ2d 1385, 1390-94 (W.D.N.Y. 1999), *later opinion*, 79 F.Supp.2d 243, 53 USPQ2d 1353 (W.D.N.Y. 1999), "The law is clear that the use of terms of degree, such as 'substantially,' in patent claims does not necessarily render the claims indefinite."; "[S]imply because claims could be

framed in terms of specific numbers does not mean that they must be. The bottom line is whether one of ordinary skill in the art would understand the claims..." (emphasis added). Furthermore, the Federal Circuit, in *Modine Manufacturing Co. v. United States International Trade Commission*, 75 F.3d 1545, 1557, 37 USPQ2d 1609, 1617 (Fed. Cir. 1996), stated that "[m]athematical precision should not be imposed for its own sake; a patentee has the right to claim the invention in terms that would be understood by persons of skill in the field of invention" (emphasis added).

As stated above, Appellant respectfully submits that one of ordinary skill in the art would be well aware of what is meant by the phrase "substantially zero." It is not necessary for Appellant to set forth a range in order for one of ordinary skill in the art to understand the scope of the use of the phrase in the present claims. While Appellants appreciate the Examiners' intent of making it "easier" during any potential subsequent litigation to determine whether a particular value would be infringing on the feature of the heat flow being "substantially zero," this is not a matter of definiteness under 35 U.S.C. § 112, second paragraph. In fact, *Gould, Inc. v. Graphic Controls Corp.*, 196 USPQ 13 (N.D. Ill. 1977) stated that "It is not clear as a matter of law that § 112 applies where the claims of the patent are precise and definite, but where infringement is hard to ascertain."

In the present case, as has been illustrated above, the term "substantially zero" is definite, albeit broad. Whether or not a particular heat flow value would infringe the feature of the heat flow being "substantially zero" is not a question of definiteness, but one of breadth. If the Examiner finds a reference that teaches all of the other features of the claims and a feature in which the heat flow is a particular value, then the issue of whether that particular value would fall within the scope of "substantially zero" would be a pertinent issue with regard to 35 U.S.C. § 102 or 103. However, in the present case, the Examiner has not cited any references that allegedly teach or suggest the features of the present invention. Thus, the Examiners' concern with regard to litigation, while appreciated by Appellant, is not material to determining whether the phrase "substantially zero" is indefinite under 35 U.S.C. § 112, second paragraph.

The Examiners' position with regard to the use of the phrase "substantially zero" is diametrically opposed to the case law and MPEP § 2173.05(b). It is quite certain that if the Examiners' position were applied to the claim limitations "to substantially increase the efficiency of the compound as a copper extractant" or "which produces substantially equal E and H plane illumination patterns" as in the case law cited above, these claim limitations would be held to be indefinite. The courts and the MPEP set forth a different standard than that asserted by the

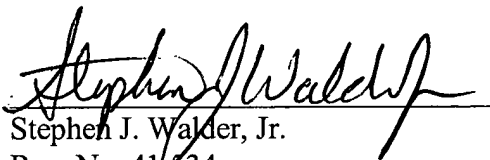
Examiners and have shown that the use of phrases such as "substantially increase," "substantially equal," and "substantially zero" are definite when one of ordinary skill in the art would understand what is meant by these phrases.

Thus, Appellant respectfully submits that the term "substantially zero" as it is used in the present claims is not indefinite, even though the term may not be precise, in accordance with MPEP § 2173.05(b). One of ordinary skill in the art, in view of the present specification, is well apprised of the scope of the claims, as discussed above.

CONCLUSION

In view of the above, Appellants respectfully submit that all of claims 1-44 are allowable and that the application is in condition for allowance. Accordingly, Appellant respectfully requests the Board of Patent Appeals and Interferences to overturn the rejections set forth in the Final Office Action.

Respectfully submitted,



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APPENDIX OF CLAIMS

The text of the claims involved in the appeal reads:

1. A method of characterizing dielectric material in a magnetic head, comprising:
using a probe to measure heat flow through the probe;
controlling a heat flow through the probe to be substantially zero; and
calculating a thermal conductance of dielectric material in the magnetic head.
2. The method of claim 1, further comprising:
cooling the magnetic head to a temperature below ambient temperature; and
applying a current to the magnetic head to warm the surface of the magnetic head until
the heat flow through the probe is substantially zero.
11. A method of controlling thermal operation of a read/write head, comprising:
determining a thermal conductance of the read/write head by controlling heat flow
through a probe to be substantially zero;
modeling thermoelectric properties of the read/write head based on the determined
thermal conductance; and
controlling thermal operation of the read/write head based on the modeling of the
thermoelectric properties.
12. The method of claim 11, wherein determining a thermal conductance includes:
using the probe to measure heat flow through the probe;

applying a current to the read/write head to maintain the heat flow through the probe at substantially zero; and

determining the thermal conductance of dielectric material in the read/write magnetic head based on the current.

13. The method of claim 12, wherein applying the current to the read/write head further comprises:

cooling the read/write magnetic head to a temperature below ambient temperature; and
applying the current to the read/write magnetic head to warm up the surface of the read/write magnetic head until the heat flow through the probe is substantially zero.

21. An apparatus for characterizing dielectric material in a magnetic head, comprising:
a probe for measuring heat flow through the probe;
means for controlling heat flow through the probe to be substantially zero; and
means for calculating a thermal conductance of dielectric material in the magnetic head.

22. The apparatus of claim 21, further comprising:
means for cooling the magnetic head to a temperature below ambient temperature; and
means for applying a current to the magnetic head to warm the surface of the magnetic head until the heat flow through the probe is substantially zero.

31. A computer program product in a computer readable medium for characterizing dielectric material in a magnetic head, comprising:

first instructions for controlling a probe to measure heat flow through the probe;
second instructions for controlling heat flow through the probe to be substantially zero;
and
third instructions for calculating a thermal conductance of dielectric material.

32. The computer program product of claim 31, further comprising:

fourth instructions for cooling the magnetic head to a temperature below ambient
temperature; and

fifth instructions for applying a current to the magnetic head to warm up the surface of the
magnetic head until the heat flow through the probe is substantially zero.